

**REMARKS**

Applicants are amending their claims, concurrently with the filing of a RCE Transmittal, to further define various aspects of the present invention. Specifically, Applicants have incorporated the subject matter of claim 2 into claim 1; and, correspondingly, have cancelled claims 2, 10 and 11 without prejudice or disclaimer.

Notwithstanding Finality of the Office Action dated October 14, 2009, clearly entry of the present amendments is proper, noting the concurrently filed RCE Transmittal. Moreover, it is respectfully submitted that the present amendments constitute the necessary Submission Under 37 CFR 1.114 for the concurrently filed RCE Transmittal.

The Request for Reconsideration After Final Rejection submitted January 14, 2010, in the above-identified application, is noted. Note that the Examiner has indicated that this Request for Reconsideration has overcome the rejection of claims 1, 12 and 13 under the first paragraph of 35 USC 112. It is respectfully submitted that the present amendments have no effect on the Examiner's decision that Applicants' original disclosure supports the subject matter of claims 1, 12 and 13, under the requirements of the first paragraph of 35 USC 112; and, noting that claim 2 was not previously rejected under the first paragraph of 35 USC 112, it is respectfully submitted that the claims as presently amended, including presently amended claim 1, satisfy all requirements of the first paragraph of 35 USC 112, including the description requirement thereof.

Applicants respectfully submit that all of the claims presented for consideration by the Examiner patentably distinguish over the teachings of the references applied by the Examiner in rejecting claims in the Office Action dated October 14, 2009, that is, the

teachings of U.S. Patent Application Publication No. 2001/0033822 to Ishii, et al., and Japanese Patent Document No. 2000-203818 to Takei, et al., under the provisions of 35 USC 103.

It is respectfully submitted that the teachings of these references as applied by the Examiner would have neither disclosed nor would have suggested such a nonaqueous electrolyte secondary battery negative electrode material, or the nonaqueous electrolyte secondary battery negative electrode using such material or nonaqueous electrolyte secondary battery using such negative electrode using such material, as in the present claims, including, inter alia, wherein each of the graphite particles included in the negative electrode material has a structure where a plurality of flat graphite fine particulate assemblies or bonds non-parallel with each other, and each of the graphite particles has a layer of carbon formed on the surface of such graphite particle, with a ratio (by weight ratio) of the layer of carbon to a respective graphite particle being in the range of 0.001-0.01, wherein the graphite particles have a volume of fine pores in the range of  $10\text{-}10^5$  nm in a volume of 400-2,000  $\text{cm}^3/\text{kg}$ ; and wherein an average diameter (50% D) is 10  $\mu\text{m}$  or more and 50  $\mu\text{m}$  or less, the aspect ratio is 5 or less, the true specific gravity is 2.22 or more, the bulk density is 780  $\text{kg}/\text{m}^3$  or more and 1,000  $\text{kg}/\text{m}^3$  or less, the specific surface area measured by a BET method is 2.0  $\text{m}^2/\text{g}$  or more and 5.0  $\text{m}^2/\text{g}$  or less, and, in a Raman spectrum analysis with argon laser light of a wavelength of 5145 Å, an R value expressed by  $R = I_{1350}/I_{1580}$  (in Raman spectrum, I1580 denotes an intensity of a peak P1 in the range of 1580 to 1620  $\text{cm}^{-1}$  and I1350 denotes an intensity of a peak P2 in the range of 1350 to 1370  $\text{cm}^{-1}$ ) is less than 0.2. See claim 1.

As will be shown in the following, by utilizing graphite particles with a layer of carbon satisfying the various parameters as in presently amended claim 1, adhesiveness of the negative electrode material, as part of the negative electrode, is unexpectedly improved, while a negative electrode made of this negative electrode material has improved charge load characteristics, discharging capacity and initial charge/discharge efficiency.

Moreover, and as also will be discussed further infra, each of the graphite particles have a structure where a plurality of flat graphite fine particulate assemblies or bonds non-parallel with each other, with a layer of carbon formed on the surface of each of the graphite particles (each particle being made of the specified fine particulate). It is respectfully submitted that the teachings of these applied references do not disclose, nor would have suggested, the layer of carbon formed on the surface of each of the graphite particles, or additional features of the present invention as in claim 1, including further definition of each of the graphite particles, or weight ratio of the layer of carbon to a respective graphite particle, or other parameters including average particle diameter, aspect ratio, true specific gravity, bulk density, specific surface area, and R value in a Raman spectrum analysis, and advantages thereof.

More particularly, it is respectfully submitted that the teachings of these applied references would have neither disclosed nor would have suggested such material as in the present claims, having the layer of carbon with the weight ratio of the layer of carbon to a respective graphite particle and other parameters as in the present claims, and wherein this layer "consists essentially of" (see claim 12), or "consists of" (see claim 13),

carbon; and/or wherein the carbon covers the respective graphite particle (see claim 14).

In addition, it is respectfully submitted that the teachings of the applied references would have neither disclosed nor would have suggested such material as in the present claims, having the layer of carbon with weight ratio of layer of carbon to the respective graphite particle, and the volume of fine pores, as in claim 1, and, additionally, wherein the material has features as in the remaining dependent claims, including slurry viscosity as in claim 3; and/or bulk density and rate of variation of bulk density as in claim 4.

The present invention relates to material for a negative electrode of a nonaqueous electrolyte secondary battery, and the negative electrode and the secondary battery formed respectively using such material and such negative electrode. The nonaqueous electrolyte secondary battery formed using such electrode and material can suitably be used in portable electronic devices, electric automobiles, electricity storage or the like.

Graphite particles for negative electrode material, in which a plurality of flat particulate are assembled or bonded so that a plurality of alignment surfaces may be non-parallel with each other, thereby forming the graphite particles, have been proposed, as described in the paragraph bridging pages 3 and 4 of Applicants' specification. However, as described in the first four lines on page 4 of Applicants' specification, there is a problem that the charging capacity (charge load characteristics) when the battery using such graphite particles is charged at a high speed, is low.

While, as described in the sole full paragraph on page 4 of Applicants' specification, it has been disclosed to coat a surface of a graphite particle with low crystalline carbon, the published application disclosing such coating does not mention any advantage in connection with charge load characteristics.

A further problem in connection with previously proposed negative electrode material utilizing graphite particles, even having a carbon coating, is that adhesiveness of the electrode material in the negative electrode is unsatisfactory. That is, the negative electrode material of the negative electrode tends to peel after pressing.

Against this background, Applicants provide negative electrode material for a nonaqueous electrolyte secondary battery, which has excellent discharge capacity, charge/discharge efficiency and charge load characteristics, and having satisfactory adhesiveness. Applicants have found that by providing a layer of carbon on the surface of each of the graphite particles, which graphite particle has a structure where a plurality of flat graphite fine particulate assemblies or bonds non-parallel with each other, with a ratio (by weight ratio) of the layer of carbon to a respective graphite particle being in a range of 0.001-0.01, and having other properties as in present claim 1, including bulk density, specific surface area and R value, objectives according to the present invention are achieved. That is, as described in the paragraph bridging pages 8 and 9 of Applicants' specification, when the ratio of the carbon layer to graphite particle is less than 0.001, an improvement width in the charge load characteristics is small; while when the ratio exceeds 0.01, the initial charge/discharge efficiency is deteriorated. By providing the weight ratio as in the present claims, charge load characteristics are excellent, with excellent initial charge/discharge efficiency.

In addition, the presently claimed subject matter includes graphite particles having a volume of fine pores in the range of  $10\text{-}10^5$  nm in a volume of 400-2000  $\text{cm}^3/\text{kg}$ . When the volume of pores in the range is less than 400  $\text{cm}^3/\text{kg}$ , the discharge load characteristics and the discharge capacity tend to decrease, while, on the other hand, when the volume exceeds 2000  $\text{cm}^3/\text{kg}$ , the cycle characteristics tend to deteriorate. Note the paragraph bridging pages 9 and 10 of Applicants' specification.

Moreover, as is described in paragraphs [0025]-[0027] on pages 13 and 14 of Applicants' specification, when a bulk density, specific surface area or R value is outside the scope of the present claims, adhesiveness of the electrode tends to deteriorate.

As to advantages achieved by the present invention, note also the paragraph bridging pages 21 and 22 of Applicants' specification.

In connection with advantages achieved according to the present invention, note, in particular, Table 4 on page 31 of Applicants' specification, particularly Examples 1-4 of the present invention as compared with Comparative Examples 2 and 3, respectively containing ratios greater than, and less than, the ratio range in the present claims. As stated in the first paragraph on page 32 of Applicants' specification, it can be seen that material according to the present invention is excellent in discharging capacity, charge/discharge efficiency and charge load characteristics.

In Examples and Comparative Examples in the above-identified application, a bulk density under pressure of 33 MPa and a rate of variation of the bulk density when the pressure is released, was measured. According to this measurement, in Comparative Examples 2 and 4, where a ratio of the layer of carbon to a respective

graphite particle is greater than the upper limit of 0.01 recited in the present claims, the electrode tends to peel after pressing, since in Comparative Examples 2 and 4 the rate of variation of the bulk density when the pressure is released exceeds 0.3, as seen respectively in Tables 2 and 5 respectively on pages 29 and 34 of Applicants' specification. As can be recognized therefrom, with values for weight ratio, as well as with other properties as in the present claims including, inter alia, bulk density, specific surface area and R value, adhesiveness of the electrode is also unexpectedly improved.

In prior responses filed by Applicants, Applicants have relied on evidence (that is, experimental data) in their specification as showing unexpectedly better results achieved by the present invention. Such unexpectedly better results provide a basis for a conclusion of unobviousness of the presently claimed subject matter. Failure to consider objective evidence is clearly improper. See Manual of Patent Examining Procedure (MPEP) 716.01(a). Note, in particular, the statement in this section of the MPEP that Examiners must consider comparative data in the specification which is intended to illustrate the claimed invention, in reaching a conclusion with regard to the obviousness of the claims. See In re Margolis, 228 USPQ 940 (CAFC 1986); and In re DeBlauwe, 222 USPQ 191 (CAFC 1984). It is respectfully submitted that this evidence in Applicants' specification must be considered in determining patentability; and, properly considered, it is respectfully submitted that this evidence establishes unobviousness of the presently claimed subject matter, even were the teachings of the applied prior art to establish a prima facie case of obviousness.

Takei, et al. discloses composite carbon particles containing a graphite part, an amorphous carbon part and silicon, the composite carbon particle being produced by

mixing a graphitic particle with an organosilicon compound and a carbon precursor, heating the resultant mixture and decomposing and carbonizing the organosilicon compound and carbon precursor. Note the English language abstract of Takei, et al. Note also paragraphs [0011] and [0012] of this patent document, describing, inter alia, that the graphite particles are graphite particles in which flat-shaped particles gather or combine with non-parallel relationship.

As recognized by the Examiner, e.g., in the first full paragraph on page 4, and in the first full paragraph on page 6, of the Office Action dated October 14, 2009, Takei, et al. would have neither disclosed nor would have suggested such features of the present invention including, inter alia, the aspect ratio, or ratio (by weight ratio), or pore volume, or true specific gravity, or bulk density, or R value, as in the present claims.

Moreover, it is respectfully submitted that Takei, et al. would have neither disclosed nor would have suggested, and in fact would have taught away from, such material as in the present claims, including the specified layer of carbon on the surface of each of the graphite particles, having the recited ratio of the layer of carbon to a respective graphite particle of 0.001 to 0.01, or other properties recited in claim 1, or wherein the layer consists essentially of carbon (see claim 12), or consists of carbon (see claim 13), as in various of the present claims. In this regard, it is noted that Takei, et al. requires silicon in the material covering the graphite grains.

It is respectfully submitted that the additional teachings of Ishii, et al. would not have rectified the deficiencies of Takei, et al., such that the presently claimed invention as a whole would have been obvious to one of ordinary skill in the art.



Ishii, et al. discloses graphite particles for use in a negative electrode for lithium secondary batteries, the graphite particles being obtained by assembling or binding together a plurality of flat-shaped particles so that the planes of orientation do not become parallel to one another. Note, in particular, paragraphs [0013] and [0014] on page 1 of this patent publication. As applied by the Examiner, note also paragraphs [0065] and [0071]-[0075] on page 5 of this patent document, disclosing that the graphite paste used in forming the negative electrode for the lithium secondary battery includes an organic binder, which organic binder can be polyethylene, polypropylene, ethylene-propylene terpolymer, butadiene rubber, styrene-butadiene rubber, butyl rubber, polymeric compounds having a high ionic conductivity, and the like.

Contrary to the contention by the Examiner, it is respectfully submitted that the combined teachings of Takei, et al., and Ishii, et al., would have neither disclosed nor would have suggested the presently claimed invention, including, inter alia, the layer of carbon on the surfaces of the graphite particles, and with the ratio (by weight ratio) of the layer of carbon to a respective graphite particle, and with, inter alia, bulk density, specific surface area and R value among other features as discussed previously.

The contention by the Examiner that Ishii, et al. would have disclosed or would have suggested, in combination with the teachings of Takei, et al., such ratio of a layer of carbon formed on the surface of each of the graphite particles, is respectfully traversed. As applied by the Examiner, Ishii, et al. discloses a binder. Ishii, et al. discloses that a mixing ratio between the graphite particles and the binder (not a layer of carbon formed on the surface of each of the carbon particles) is utilized in the amount

by weight recited in the reference, per 100 parts by weight of graphite particles. It is respectfully submitted that the binder in Ishii, et al. is used for bonding graphite particles with each other, and not for forming a layer on a surface of the graphite particle. It is respectfully submitted that such binder disclosed in Ishii, et al., would have neither taught nor would have suggested the layer of carbon formed on the surface of the graphite particles as in the present claims, much less in the weight ratio as in the present claims, and advantages achieved thereby.

Thus, it is respectfully submitted that the binder in Ishii, et al., is a binder necessary to produce negative electrode material for a secondary battery, and is used to bond between a negative electrode material and a current collector. It is respectfully submitted that this binder material in Ishii, et al. is not for forming a layer of carbon on a surface of the graphite particles.

As Ishii, et al. discloses a binder material for, e.g., bonding the graphite particles to a current collector, amount of binder as disclosed in Ishii, et al. would have neither taught nor would have suggested the weight ratio of carbon layer to graphite particle as in the present claims, and advantages thereof.

Thus, while the Examiner relies on the teachings of Ishii, et al. as disclosing the weight ratio in the present claims, as discussed in the paragraph bridging pages 5 and 6 of the Office Action dated October 14, 2009, in view of the purpose of the binder in Ishii, et al., including its purpose of binding to the current collector, it is respectfully submitted that the teachings of Ishii, et al., even in combination with the teachings of Takei, et al., would have neither disclosed nor would have suggested the presently claimed subject matter, including, inter alia, layer of carbon or weight ratio of the layer of carbon to the

graphite particles, on the surface of the graphite particles, in particular covering the graphite particles, and advantages achieved thereby.

The contention by the Examiner in the paragraph bridging pages 3 and 4 of the Office Action dated October 14, 2009, that the flat-shaped, non-spherical, non-parallel particles of Takei, et al. is the equivalent of Applicants' graphite particles, is respectfully traversed. It is respectfully submitted that the flat-shaped particles in Takei, et al., are the individual particles with a flat shape, which gather or combine with non-parallel position. In contrast, the graphite particles according to the present invention each have a structure where a plurality of flat graphite fine particulate assembles of bonds non-parallel with each other. That is, each of the graphite particles of the presently claimed subject matter is constructed of a plurality of flat graphite fine particulates. It is respectfully submitted that Takei, et al. would have neither taught nor would have suggested such feature of the present invention, with the layer of carbon formed on the surface of each of the graphite particles, the particles being formed of the specified particulate, and with a ratio (by weight) of the layer of carbons to a respective graphite particle, as in the present claims, and advantages thereof.

In the Office Action dated October 14, 2009, the Examiner repeatedly contends that various properties recited in the claims are inherent in the structure of Takei, et al. Such contention is respectfully traversed. The material of the present invention differs from the material of Takei, et al., even as indicated by the Examiner (note that a combination of teachings of references has been applied), and the properties in the present claims have not been shown to be inherent in the material of Takei, et al.

In addition, note that the Comparative Examples as described in the specification of the above-identified application prepared negative electrode material by processes similar to those in the Examples, but the materials formed in the Comparative Examples were outside the scope of the properties as in the present claims. This supports the conclusion that properties not explicitly taught in Takei, et al. are not inherent, contrary to the contention by the Examiner.

That is, while material in the Comparative Examples are produced by similar procedures to that providing the negative electrode material of the present claims, such material of the Comparative Examples is outside the scope of the present claims, thus, showing that properties of the Comparative Examples, while formed by similar processes, do not inherently have the same properties.

In Item A) on page 2 of the Advisory Action mailed January 28, 2010, the Examiner contends that the citation of Table 4 as showing unexpectedly better results "is not sufficient to overcome the obviousness rejection since the properties of the comparative examples (especially comparative example 2) are substantially similar to examples 1-4". Such contention by the Examiner is respectfully traversed. It is respectfully submitted that the discharging capacity of Comparative Example 2 is smaller than that in the Examples, because the ratio (by weight ratio) of the layer of carbon to a respective graphite particle in Comparative Example 2 is greater than the maximum in the present claims, i.e., greater than 0.01. The difference in discharging capacity between the Examples within the scope of the present invention and Comparative Example 2 is several mAh/g. This difference is large for a battery (especially a small battery) whose objective is to enlarge discharging capacity. For

example, in case that the batteries are used in a cellular phone, the difference in discharging capacity would bring a large difference in cell duration.

It is possible to calculate a charging capacity based on the discharging capacity and the charge/discharge efficiency. The difference between the charging capacity and the discharging capacity, that is, irreversible capacity, is 35 to 36 Ah/kg in Examples 1-4, while in Comparative Example 2 this difference is 38 Ah/kg, inferior to that in Examples 1-4. Therefore, in a case that the batteries of the same discharging capacity in the Examples and in Comparative Example 2 are made, an amount of active material needed for the battery of Comparative Example 2 is larger than that of the batteries of Examples 1-4. As a result, the battery weight of Comparative Example 2 becomes larger than that of the Examples, as can be seen in the enclosed Table. Accordingly, in Comparative Example 2, an extra amount of active material is consumed at mass production, even though there is a small difference in connection with individual batteries, which is not economical.

As can be seen in the foregoing, even if there is only a small difference in discharging capacity, this difference is not negligible in practical use.

Moreover, the Examples are different from the Comparative Example not only with regard to charge load characteristics, discharge capacity and initial charge/discharge efficiency, but also in adhesiveness of the electrode. As is described in paragraph [0005] on page 4 of Applicants' specification, when a low crystalline carbon is simply coated on a surface of the graphite particle, the discharge capacity and initial charge/discharge efficiency are deteriorated since the discharge capacity of the low crystalline carbon is small and the irreversible capacity at the initial discharge is

large. Furthermore, since a problem that the electrode tends to be peeled after pressing it is generated, features of the non-alignment of the graphite particle are lost, resulting in a deterioration of characteristics of the obtained nonaqueous electrolyte secondary battery. Thus, not only is the initial charge/discharge efficiency deteriorated in this previously proposed procedure described in paragraph [0005] on page 4 of Applicants' specification, but also adhesiveness is deteriorated.

In paragraph [0018] on pages 8 and 9 of Applicants' specification, it is described that when the ratio of the surface carbon to the graphite particle is greater than 0.01, initial charge/discharge efficiency is deteriorated. Furthermore, and as will be described in the following, when the weight ratio is greater than that in the present claims (that is, greater than 0.01), the particle becomes hard; and, when an electrode containing such particle is pressed, since the spring-back due to the elastic deformation becomes large, the electrode tends to peel after pressing. In connection therewith, note paragraph [0031] on page 16 of Applicants' specification. It is described therein that the rate of bulk density variation when the pressure is released being large, means that particles are elastically deformed under the pressure, and upon releasing the pressure the deformation is freed. When an electrode is prepared with a negative electrode material which has a bulk density under pressure of 33 MPa that is less than  $1850 \text{ kg/m}^3$  and the rate of variation upon releasing the pressure exceeds 0.3, there is a problem that the electrode, after pressing, tends to peel.

As discussed previously, attention is respectfully directed to Comparative Examples 2 and 4, showing that when the ratio of a layer to carbon to a respective graphite particle exceeds the upper limit of 0.01, the electrode (negative electrode)

tends to peel after pressing, since the rate of variation of the bulk density in Comparative Examples 2 and 4 when the pressure is released exceeds 0.3.

In Item B) on page 2 of the Advisory Action mailed January 28, 2010, the Examiner contends that since Koichi (that is, Takei, et al.) teaches individual graphite particles covered with amorphous carbon, in paragraph [0011] thereof, "the teachings of the prior art still meet the claimed limitations of amended claim 1". This contention by the Examiner is respectfully traversed.

The composite carbon particle disclosed by Takei, et al. contains amorphous carbon more than the amount of the carbon covered with the surface of the graphite particle according to the present invention. Therefore, the amorphous carbon and silicon compound exist not only on the surface of the graphite, but also in the gap of graphite particles, and it is different from the construction of the negative electrode material of the present invention wherein the amorphous carbon exists only on the surface of the graphite particle, e.g., covers the surface of the graphite particle.

In Examples 1-4 of the present disclosure, 1.2-12 g of coal tar pitch and 600 g of graphite particles are mixed to form the carbon layer, and to make the ratio of the layer of carbon to a respective graphite particle to be in the range of 0.001-0.01. In contrast, Takei, et al. mixes 100 parts by weight of graphite particle and 30 parts by weight carbon precursor and 30 parts by weight tetramethoxysilane condensate. Takei, et al. describes in paragraph [0026] thereof that it is preferable that 40-90 mass% of graphite particles, 5-30 mass% of tetramethoxysilane condensate and 5-30 mass% of carbon precursor is mixed.

The mixing ratio of graphite particle and coal tar pitch in the present invention is 600:12 to 1.2 (which equals 100:0.02-0.002), while the ratio of Takei, et al. is 100:30 (preferably 40:30 to 90:5 (=100:75 to 100:5.6)) in Example 1 thereof, which shows that Takei, et al. used the coal tar pitch (carbon precursor) in a much greater amount than that in the negative electrode according to the present invention. Therefore, Takei, et al. described in paragraph [0026] that silicon and carbon exist not only on the surface of the graphite particle, but also inside the graphite particle.

Moreover, it is respectfully submitted that the R value in Takei, et al. must be much larger than that in the present claims, since the amount of the amorphous carbon in Takei, et al. is more than the amount of the carbon covered on the graphite particle according to the present invention.

In Item C) on page 2 of the Advisory Action mailed January 28, 2010, the Examiner contends that Ishii, et al. teaches a binder of an organic carbon mixed with graphite particles, referring to paragraphs [0065] and [0075] of this reference, and contends that this mixing would consequently result in the carbonaceous binder being attached to a surface of the graphite particles. Even as interpreted by the Examiner, this reference does not disclose, nor would have suggested, the layer of carbon covering the respective graphite particles, as in claim 14.

Moreover, it is respectfully submitted that the binder described in paragraph [0065] of Ishii, et al. is the binder to make graphite particles. This disclosure is about the graphite particle. What Ishii, et al. discloses is different from the carbon layer formed on the surface of the graphite particle, as in the present invention.



Furthermore, the organic binder described in paragraph [0075] of Ishii, et al. is an organic binder needed to make a negative electrode for a lithium secondary battery. The organic binder is used to bond graphite particles with each other, or to bond between the negative electrode material and a current collector. It is respectfully submitted that the organic binder does not change to carbon by being carbonized, and still exists as an organic compound. Therefore, this organic binder is different from the carbon layer formed on the surface of the graphite particle according to the present invention, and either by itself or together with the teachings of Takei, et al., would have neither disclosed nor would have suggested the layer of carbon formed on the surface of each of the graphite particles, or weight ratio of the layer of carbon to a respective graphite particle as in the present claims, and advantages thereof.

In view of the foregoing comments and amendments, and in view of the concurrently filed RCE Transmittal, entry of the present amendments, and reconsideration and allowance of all claims presently in the above-identified application, are respectfully requested.

To the extent necessary, Applicants hereby petition for an extension of time under 37 CFR 1.136. Kindly charge any shortage of fees due in connection with the filing of this paper, including any extension of time fees, to the Deposit Account of

April 14, 2010

Antonelli, Terry, Stout & Kraus, LLP, Account No. 01-2135 (case 1204.46017X00), and  
please credit any overpayments to such Deposit Account.

Respectfully submitted,

**ANTONELLI, TERRY, STOUT & KRAUS, LLP**

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Enclosure: Table (1 pg.)

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TABLE

	Example 1	Example 2	Example 3	Example 4	Comparative example 1	Comparative example 2	Comparative example 3	Remarks
Superficial carbonization rate	0.01	0.005	0.003	0.001	0	0.03	0.0005	see Table 4
Discharging capacity	361	380	382	381	363	383	380	see Table 4
Charge/discharge efficiency (%)	90.9	90.8	91.1	91.0	91.0	90.5	91.0	see Table 4
Charging capacity	397	386	397	397	399	396	396	
Negative electrode weight	7.92	7.94	7.90	7.92	7.88	7.99	7.94	in case of 2600mAh, Negative/Positive Electrode Capacity ratio:1.1
Charging capacity of negative electrode	3146	3150	3139	3143	3143	3180	3143	
Positive electrode weight	17.0	17.0	17.0	17.0	17.0	17.1	17.0	charge 168 mAh/g
Negative electrode weight ratio	99.2%	99.4%	98.9%	99.2%	98.6%	100.0%	99.4%	against comparative example 2
Negative electrode density	1.69	1.69	1.68	1.69	1.68	1.70	1.69	comparative example 2 is 1.70 g/cm <sup>3</sup>
Total weight	24.95	24.89	24.89	24.93	24.89	25.09	24.95	total weight of active material needed for positive/negative electrode
Difference of total weight against comparative example 2	-0.14	-0.10	-0.20	-0.16	-0.20	0.00	-0.14	
Irreversible capacity	36	36	35	36	36	38	36	